

PROJECT MEMORANDUM

DATE: April 5, 1993
TO: Joe Depner, Hydrogeologist
FROM: Nels Cone, Chemist
SUBJECT: DATA VALIDATION OF ANALYTICAL RESULTS FROM PIER 91 RCRA FACILITY INVESTIGATION, PROJECT 624878, DATA SET #8C

FILE COPY

During the period of January 18 to February 9, 1993, soil samples were collected by Burlington Environmental field personnel. These samples were submitted to Burlington Corporate Laboratory for metals analysis (EPA SW-846 Method 6010) and PCBs analysis (EPA SW-846 Method 8080 modified) (work orders 44363, 44827, 44663, and 44469). I performed a review of the analytical results for the following samples:

CP-122A-DW	CP-122AC-6-8	CP-122B-2-4	CP-115B-18-20	CP-106B-2-4	CP-106B-18-20
CP-122AC-2-4	CP-122AC-22-24	CP-122B-6-8	CP-115B-36-38	CP-106B-6-8	

Properly completed chain-of-custody forms were included, along with documented signatures from field to laboratory receipt. The samples were shown as having been properly iced and received in good condition. Holding times were clearly written and evaluated according to regulatory protocol (*National Functional Guidelines for Organic (and Inorganic) Data Review*, USEPA, 1991). The samples received the analyses as required by the Quality Assurance Project Plan (QAPP), and laboratory extraction/analysis times met the established guidelines.

Method blank data met acceptable quality control (QC) limits. All laboratory control samples, post digestion spike recoveries, PCB surrogate recoveries, initial calibration verification, and continuing calibration verification met requisite QC criteria.

Matrix spike/matrix spike duplicate analyses displayed analytical accuracy within required guidelines, with the exception of selenium recoveries on samples CP-115B-36-38 and CP-115B-18-20. Regardless, the data quality objectives as defined in Table F-2 of the QAPP are met. Accordingly, this data set can be considered valid for its intended use.

NC/rlk/b46:2193b.mem



Burlington
Environmental

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MAR 18 1993

Burlington Environmental Inc.
Technical Services

March 17, 1993

Joe Depner
Burlington Environmental Technical Services
2203 Airport Way South, Suite 400
Seattle, WA 98134

Project: Pier 91 Project #624878, Task #7304
Burlington Environmental Corporate Laboratory Number 44363

Dear Joe:

Five soil samples for the Pier 91 Project #624878, Task #7304 were received at our laboratory January 20, 1993. The samples were received in good condition. The samples were analyzed for total metals and PCBs at the Burlington Environmental Corporate Laboratory.

All samples were extracted and analyzed within EPA SW-846 required holding times. Analysis dates and extraction dates (as applicable) are included in the metals report. The PCBs were extracted and analyzed in batches. These dates are tabulated below. All PCB surrogates recovered between 50% and 150%.

<u>Laboratory Number(s)</u>	<u>GC Run Number(s)</u>	<u>Date(s) Extracted</u>	<u>Date(s) Analyzed</u>
44363-1,2,3,4,5, QC1260, and B01213-1	AAKG and BAKH	1/21/93	1/25/93 and 1/27/93

The analyst(s) name(s) and the instrument used for each analyte are specified on the PCB report and are listed below for the metals analytes.

<u>Analyte(s)</u>	<u>Analyst</u>	<u>Instrument Make and Model</u>
Mercury	Barbara L. Walker	Perkin Elmer 50B Mercury Analyzer
Arsenic, Selenium, Lead	Bruce Bell	Perkin Elmer 5100Z Graphite Furnace Atomic Absorption Spectrometer
Silver, Barium, Cadmium, Copper, Chromium, Nickel, Zinc	Eric Larson	Leeman Labs PS3000 Inductively Coupled Plasma Atomic Emission Spectrometer

All analyses were conducted according to EPA SW-846 Methods specified in the work plan. Additional analytical and quality control information is included in the attached analytical reports.

Sincerely,

Kathy E. Kreps
Laboratory Manager
Burlington Environmental Inc.

enclosure



BURLINGTON
ENVIRONMENTAL

General Laboratory Report

Lab Number : 44363

Plant/Generator Name : Pier 91; Project #624878; Task #7304

Sample Type : Soils; CP-122B and CP-122AB

Date of Receipt : 01/20/93 Analyst: BLW, BB, EL, GCH

Date of Report : 03/17/93 QC Checked: *Kathy [signature]* 3/17/93

Parameters for Analysis: Total Metals, PCBs

Outside Lab : None Outside Lab Report No:

Data:

These soil samples from the Pier 91 project 624878, task 7304, labeled CP-122B-2-4, CP-122B-6-8, CP-122AC-2-4, CP-122AC-6-8, and CP-122AC-22-24, were analyzed for total metals and for PCBs. Copies of the results are attached.

Comments and Conclusions:



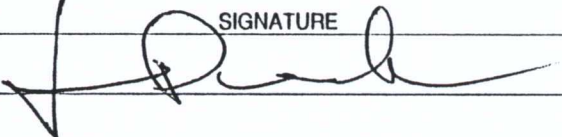
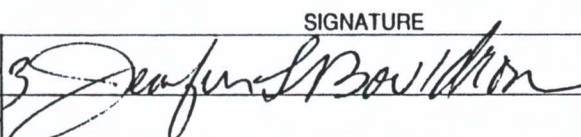
CHAIN-OF-CUSTODY RECORD

C.O.C. SERIAL NO. 6085

[illegible]

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SIGNATURE		DATE	TIME	SIGNATURE		DATE	TIME
		11/20	11:20/93			11/20/93	2:00pm
SHIPPING NOTES				LAB NOTES			

PCB Laboratory Report

Page 1

Lab Number : 44363

Plant/Generator Name : PIER 91 / PJ#624878 TASK 7304

Sample Type : SOIL

Date of Receipt : 01/20/93

Date of Report : 01/27/93

Outside Lab : NONE

Number of Samples : 5

Analyst: GCH

QC Checked: *AKW* 2/1/93

Outside Lab Report No:

<u>Run #</u>	<u>Sample ID</u>	<u>Code</u> <u>Numbers</u>	<u># Drums</u> <u>in Composite</u>	<u>Aroclor #</u>	<u>Total PCB</u> <u>(ppm)</u>
BAKH82	44363-1	CP-122B-2-4			<0.038
BAKH83	44363-2	CP-122B-6-8			<0.039
BAKH84	44363-3	CP-122AC-2-4			<0.045
AAKG19	44363-4	CP-122AC-6-8			<0.040
AAKG20	44363-5	CP-122AC-22-24			<0.041
AAKG31	QC 1260	ADVISORY RANGE (6.6-24)		1260	12.
AAKG22	B01213-1	BLANK			<0.1
AAKG15	CCV	A1254		5.23	105%
AAKG23	CCV	A1254		4.87	97%
AAKG28	CCV	A1248		4.99	100%
AAKG29	CCV	A1254		4.31	86%
AAKG30	CCV	A1260		4.61	92%
AAKG41	CCV	A1248		4.67	93%
BAKH81	CCV	A1254		5.77	115%
BAKH90	CCV	A1254		5.74	115%

ANALYST = GWENDOLYN C. HUGGINS
INSTRUMENT = HP 5890 GC

Metals Laboratory Report

Lab Number : 44363

Plant/Generator Name : PIER 91 PJ# 624878 TASK 7304

Sample Type : SOIL

Date of Receipt : 01/20/93

Date of Report : 02/08/93

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Analyst: BLW, BB, EL

QC Checked: *[Signature]* 2/5/93

Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

	44363-1 CP-122B-2-4	44363-2 CP-122B-6-8	44363-3 CP-122AC-2-4	44363-4 CP-122AC-6-8
Metals:				
Silver	<0.43	<0.41	<0.43	<0.43
Arsenic	3.3	2.6	13.0	1.8
Barium	139	17.2	85.4	23.5
Beryllium	<0.21	<0.21	<0.22	<0.21
Cadmium	<0.21	<0.21	<0.22	<0.21
Chromium	15.2	12.7	17.9	15.3
Copper	27.4	7.3	31.5	9.4
Mercury	0.036	<0.019	0.063	<0.019
Nickel	21.1	23.6	19.2	21.6
Lead	15.1	2.3	28.8	6.6
Selenium	<0.22	<0.39	<0.21	<0.41
Zinc	37.7	65.2	109	30.8
Dry Weight	86.6%	85.6%	73.1%	82.0%

Comments and Conclusions:

RESULTS ARE REPORTED AS MG/KG DRY WEIGHT.

Metals Laboratory Report

Lab Number : 44363

Plant/Generator Name : PIER 91 PJ# 624878 TASK 7304

Sample Type : SOIL

Date of Receipt : 01/20/93

Analyst: BLW, BB, EL

Date of Report : 02/08/93

QC Checked: *[Signature]* 2/5/93

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

	44363-5
<u>Metals:</u>	<u>CP-122AC-22-24</u>
Silver	<0.41
Arsenic	1.9
Barium	11.9
Beryllium	<0.21
Cadmium	<0.21
Chromium	15.5
Copper	4.5
Mercury	0.022
Nickel	17.8
Lead	1.6
Selenium	<0.21
Zinc	16.0
Dry Weight	80.2%

Comments and Conclusions:

RESULTS ARE REPORTED AS MG/KG DRY WEIGHT.

Metals Laboratory Report

Lab Number : 44363Q

Plant/Generator Name : PIER 91 Pj# 624878 TASK 7304

Sample Type : SOIL

Date of Receipt : 01/20/93

Analyst: BLW, BB, EL

Date of Report : 02/08/93

QC Checked: *[Signature]* 2/8/93

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

Metals:	PREPARATION BLANK (MG/L)	LCS PPS-46 % RECOVERY	44363-4 MS % RECOVERY	44363-4 MSD % RECOVERY
Silver	<0.010	81.8	76.2	63.6
Arsenic	<0.10	115.9	90.3	91.9
Barium	<0.20	80.1	93.8	88.9
Beryllium	<0.005	85.9	95.2	95.4
Cadmium	<0.005	83.0	90.5	81.8
Chromium	<0.010	103.2	128.9	81.4
Copper	<0.025	90.6	136.9	94.4
Mercury	<0.0002	73.0*	114.7	106.8
Nickel	<0.040	92.1	119.3	88.0
Lead	<0.050	88.7	105.8	112.0
Zinc	<0.020	90.9	132.8	89.4

Comments and Conclusions:

RESULTS ARE REPORTED AS MG/L AND PERCENT RECOVERY.

DATES ANALYZED: 1/25/93, 1/27/93, 2/2/93, 2/3/93.

*MERCURY LCS = SRS003-050

Metals Laboratory Report

Lab Number : 44363Q

Plant/Generator Name : PIER 91 Pj# 624878 TASK 7304

Sample Type : SOIL

Date of Receipt : 01/20/93

Analyst: BLW, BB, EL

Date of Report : 02/08/93

QC Checked: *[Signature]* 2/8/93

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

Metals:	44363-4 PDS	% RECOVERY	CCV	CCV
	% RECOVERY	ICV		
Silver	86.2	98.6	98.5	99.6
Arsenic			98.8	97.2
Barium			96.5	96.9
Beryllium			97.1	98.9
Cadmium			97.6	100.9
Chromium	87.7	93.7	97.2	99.6
Copper	86.4		99.0	99.2
Mercury			106.1	96.6
Nickel	89.9		99.9	104.7
Lead			100.5	103.5
Selenium		99.1		
Zinc	84.7		96.7	98.0

Comments and Conclusions:

RESULTS ARE REPORTED AS PERCENT RECOVERY.
PDS = POST DIGESTION SPIKE

Metals Laboratory Report

Lab Number : 44363Q

Plant/Generator Name : PIER 91 Pj# 624878 TASK 7304

Sample Type : SOIL

Date of Receipt : 01/20/93

Date of Report : 02/08/93

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Analyst: BLW BB EJ

QC Checked: *[Signature]* 2/8/93

Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

Metals:	% RECOVERY	CCV	GFAA	GFAA
	CCV		CCV	CCV
Silver	100.3	100.5	94.7	98.9
Arsenic	98.3	98.3		
Barium	99.8	96.9		
Beryllium	101.5	94.3		
Cadmium	99.7	93.8		
Chromium	98.2	98.1		
Copper	105.6	103.7		
Nickel	101.9	96.1	105.2	106.4
Lead			90.3	97.7
Selenium				
Zinc	99.6	95.7		

Comments and Conclusions:

RESULTS ARE REPORTED AS PERCENT RECOVERY.

Metals Laboratory Report

Lab Number : 44363Q

Plant/Generator Name : PIER 91 Pj# 624878 TASK 7304

Sample Type : SOIL

Date of Receipt : 01/20/93

Analyst: BLW BB EI

Date of Report : 02/08/93

QC Checked: *[Signature]* 2/8/93

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

GFAA METALS BY SW-846 3050, 7000.

Metals:	% RECOVERY		ICV GFAA	ICV GFAA
	CCV GFAA	CCV GFAA		
Arsenic	97.5	95.5	100.7	99.7
Lead	108.8			
Selenium	94.1	93.1		

Comments and Conclusions:

RESULTS ARE REPORTED AS PERCENT RECOVERY.

Metals Laboratory Report

Lab Number : 44363Q
Plant/Generator Name : PIER 91 Pj# 624878 TASK 7304
Sample Type : SOIL
Date of Receipt : 01/20/93 Analyst: BLW, BB, EL
Date of Report : 02/08/93 QC Checked: *[Signature]* 2/8/93
Parameters for Analysis: TOTAL METALS
Outside Lab : NONE Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

Metals:	PREPARATION BLANK GFAA MG/L	LCS - GFAA % RECOVERY
Arsenic	<0.010	101.7
Lead	<0.003	100.8
Selenium	<0.005	98.6

Comments and Conclusions:

RESULTS ARE REPORTED AS PERCENT RECOVERY.



CHAIN-OF-CUSTODY RECORD

C.O.C. SERIAL NO.

BE-34 (1/9)[illegible]



Certification

PriorityPollutnT™/CLP Quality Control Standards

Inorganics in Soil

Parameter	Lot Number 212 Certified Value mg/kg	Advisory Range mg/kg
TRACE METALS		
aluminum	11500	6530-16500
antimony	52	0-160
arsenic	15	5.6-25
barium	134	93-174
beryllium	15	9.5-21
cadmium	109	76-142
calcium	7130	4990-9270
chromium	41	20-62
cobalt	211	148-274
copper	20	8.0-32
iron	14500	10100-20150
lead	74	37-111
magnesium	3620	2530-4710
manganese	310	217-403
mercury	31	15-46
molybdenum	16	8.0-24
nickel	28	8.0-48
potassium	3790	2650-4930
selenium	91	45-136
silver	37	18-56
sodium	400	173-627
thallium	99	48-150
vanadium	57	40-74
zinc	53	26-80
CYANIDE	147	74-220

Certificate of Analysis

SOLID WASTE LABORATORY CONTROL SAMPLE

Catalog No: SRS003

Name: Metals on Soil

Lot No: BC003

USE EPA METHOD* 3050

Analysis by EPA* Method 3050

Arsenic (CAS# 1327-53-3)
Barium (CAS# 7440-39-3)
Cadmium (CAS# 7440-43-9)
Chromium (CAS# 7440-47-3)
Mercury (CAS# 7439-97-6)

30 \pm 20 PPM
575 \pm 65 PPM
1.3 \pm 0.7 PPM
12 \pm 5 PPM
6 \pm 3 PPM

* Test methods for evaluating SW846, Third Edition, 1986

Analytical ranges based on interlab 95% confidence levels.

Results based on a dry weight basis.

Manufactured by Resource Technology Corporation
for exclusive distribution by FISHER SCIENTIFIC.



Fisher
Scientific

Chemical Division
1 Reagent Lane
Fair Lawn, N.J. 07410
(201) 796-7100



Burlington
Environmental

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MAR 18 1993

Burlington Environmental Inc.
Technical Services

March 17, 1993

Joe Depner
Burlington Environmental Technical Services
2203 Airport Way South, Suite 400
Seattle, WA 98134

Project: Pier 91 Project #624878, Task #7304
Burlington Environmental Corporate Laboratory Number 44827

Dear Joe:

One soil sample for the Pier 91 Project #624878, Task #7304 was received at our laboratory February 10, 1993. This sample was received in good condition. The sample was analyzed for total metals and PCBs at the Burlington Environmental Corporate Laboratory.

All samples were extracted and analyzed within EPA SW-846 required holding times. Analysis dates and extraction dates (as applicable) are included in the metals report. The PCBs were extracted and analyzed in batches. These dates are tabulated below. All PCB surrogates recovered between 50% and 150%.

<u>Laboratory Number(s)</u>	<u>GC Run Number(s)</u>	<u>Date(s) Extracted</u>	<u>Date(s) Analyzed</u>
44827, QC1254, and B02113-1	AAKL	2/11/93	2/12/93

The analyst(s) name(s) and the instrument used for each analyte are specified on the PCB report and are listed below for the metals analytes.

<u>Analyte(s)</u>	<u>Analyst</u>	<u>Instrument Make and Model</u>
Mercury	Barbara L. Walker	Perkin Elmer 50B Mercury Analyzer
Arsenic, Selenium, Lead	Bruce Bell	Perkin Elmer 5100Z Graphite Furnace Atomic Absorption Spectrometer
Silver, Barium, Cadmium, Copper, Chromium, Nickel, Zinc	Eric Larson	Leeman Labs PS3000 Inductively Coupled Plasma Atomic Emission Spectrometer

All analyses were conducted according to EPA SW-846 Methods specified in the work plan. Additional analytical and quality control information is included in the attached analytical reports.

Sincerely,

Kathy E. Kreps
Laboratory Manager
Burlington Environmental Inc.

enclosure



BURLINGTON
ENVIRONMENTAL

General Laboratory Report

Lab Number : 44827
Plant/Generator Name : Pier 91; Project #624878, Task #7304
Sample Type : Soil; CP-115B-36-38
Date of Receipt : 02/10/93 Analyst: BLW,BB,EL,AFS
Date of Report : 03/17/93 QC Checked: *Gatty O'Leary* 3/17/93
Parameters for Analysis: Total Metals and PCBs
Outside Lab : None Outside Lab Report No:

Data:

This soil sample from the Pier 91 project 624878, task 7304, labeled CP-115B-36-38, was analyzed for total metals and PCBs. Copies of the results are attached.

Comments and Conclusions:



**BURLINGTON
ENVIRONMENTAL**

210 West Sand Bank Road
P.O. Box 330
Columbia, IL 62236-0330
618/281-7173
618/281-5120 FAX

CHAIN-OF-CUSTODY RECORD

C.O.C. SERIAL NO. 6254

[illegible]

RELINQUISHED BY:

SIGNATURE

DATE _____

TIME

RECEIVED BY

SIGNATURE

DATE _____

TIME

SHIPPING NOTES

LAB NOTES

PCB Laboratory Report

Page 1

Lab Number : 44827

Plant/Generator Name : / PIER 91 PJ #624878, TASK #7304

Sample Type : SOIL

Date of Receipt : 02/10/93

Date of Report : 02/18/93

Outside Lab :

Number of Samples : 1

Analyst: AFS

QC Checked: *Kullen 2/18/93*

Outside Lab Report No:

<u>Run #</u>	<u>Sample ID</u>	<u>Code</u> <u>Numbers</u>	<u># Drums</u> <u>in Composite</u>	<u>Aroclor #</u>	<u>Total PCB</u> <u>(ppm)</u>
AAKL37	44827	CP-115B-36-38			<0.042
AAKL39	B02113-1	BLANK			<0.1
AAKM3	QC 1254	TRUE VALUE= 49. 7		1254 51.0	109%
AAKL36	CCV	A1254 (5.0 ppm)		1254 4.95	99%
AAKL40	CCV	A1248 (5.0 ppm)		1248 5.02	100%
AAKM2	CCV	A1248 (5.0 ppm)		1248 4.55	91%
AAKM4	CCV	A1248 (5.0 ppm)		1248 4.85	97%

Metals Laboratory Report

Lab Number : 44827

Plant/Generator Name : PIER 91 PJ #624878, TASK #7304

Sample Type : SOIL

Date of Receipt : 02/10/93

Analyst: BLW, BB, EL

Date of Report : 02/25/93

QC Checked:

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

	44827	44827 MS	44827 MSD	% RECOVERY
Metals:	CP-115B-36-38	% RECOVERY	% RECOVERY	PDS
Silver	<0.41	71.2	70.6	81.9
Arsenic	2.7	119.2	115.2	
Barium	14.2	83.6	86.8	
Beryllium	<0.20	91.4	90.6	
Cadmium	<0.20	82.0	86.0	
Chromium	19.2	70.8	53.4	79.3
Copper	7.9	88.4	86.5	
Mercury	0.029	115.1	119.2	
Nickel	20.2	82.5	75.6	
Lead	1.3	94.3	89.6	
Selenium	<0.41	42.9	37.0	53.9
Zinc	20.4	82.3	79.6	
Dry Weight	78.9%			

Comments and Conclusions:

RESULTS ARE REPORTED AS MG/KG DRY WEIGHT.
PDS = POST DIGESTION SPIKE
DATES ANALYZED: 2/16/93, 2/17/93, 2/18/93.

Metals Laboratory Report

Lab Number : 44827Q

Plant/Generator Name : PIER 91 Pj#624878 TASK 7304

Sample Type : SOIL

Date of Receipt : 02/10/93

Analyst: BLW, BB, EL

Date of Report : 02/25/93

QC Checked: *[Signature]*

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

Metals:	PREPARATION BLANK MG/L	% RECOVERY ICV	% RECOVERY CCV	% RECOVERY CCV
Silver	<0.010		96.6	95.6
Arsenic	<0.010	106.7	97.0	93.9
Barium	<0.20		94.1	94.6
Beryllium	<0.005		96.4	95.9
Cadmium	<0.005		99.1	97.5
Chromium	<0.010		97.2	97.5
Copper	<0.025		98.6	97.0
Mercury	<0.0002		94.8	
Nickel	<0.040		96.4	95.9
Lead	<0.003	97.3	104.4	
Selenium	<0.005	100.1	98.5	94.1
Zinc	<0.020		97.5	96.0

Comments and Conclusions:

RESULTS ARE REPORTED AS PERCENT RECOVERY.

Metals Laboratory Report

Lab Number : 44827Q

Plant/Generator Name : PIER 91 Pj#624878 TASK 7304

Sample Type : SOIL

Date of Receipt : 02/10/93

Analyst: BLW BB, EL

Date of Report : 02/25/93

QC Checked: *[Signature]* 2/25/93

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

Metals:	% RECOVERY	CONTROL PPS-46
	CCV	% RECOVERY
Silver		77.8
Arsenic	90.2	103.9
Barium		76.6
Beryllium		79.9
Cadmium		74.3
Chromium		96.4
Copper		90.0
Mercury		102.5
Nickel		85.2
Lead		95.1
Selenium	92.6	95.2
Zinc		91.4

Comments and Conclusions:

RESULTS ARE REPORTED AS PERCENT RECOVERY.



Certification

PriorityPollutnT™/CLP Quality Control Standards

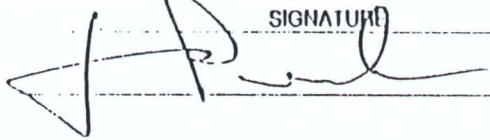
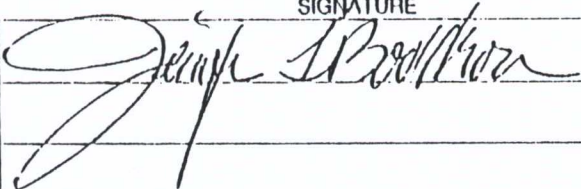
Inorganics in Soil

Parameter	Lot Number 212 Certified Value mg/kg	Advisory Range mg/kg
TRACE METALS		
aluminum	11500	6530-16500
antimony	52	0-160
arsenic	15	5.6-25
barium	134	93-174
beryllium	15	9.5-21
cadmium	109	76-142
calcium	7130	4990-9270
chromium	41	20-62
cobalt	211	148-274
copper	20	8.0-32
iron	14500	10100-20150
lead	74	37-111
magnesium	3620	2530-4710
manganese	310	217-403
mercury	31	15-46
molybdenum	16	8.0-24
nickel	28	8.0-48
potassium	3790	2650-4930
selenium	91	45-136
silver	37	18-56
sodium	400	173-627
thallium	99	48-150
vanadium	57	40-74
zinc	53	26-80
CYANIDE	147	74-220



CHAIN-OF-CUSTODY RECORD

C.O.C. SERIAL NO. 6254

RELINQUISHED BY			RECEIVED BY		
SIGNATURE	DATE	TIME	SIGNATURE	DATE	TIME
	2-10-23	1720		2/10/23	1720
SHIPPING NOTES			LAB NOTES		



Burlington
Environmental

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MAR 18 1993

Burlington Environmental Inc.
Technical Services

March 17, 1993

Joe Depner
Burlington Environmental Technical Services
2203 Airport Way South, Suite 400
Seattle, WA 98134

Project: Pier 91 Project #624878, Task #7304
Burlington Environmental Corporate Laboratory Number 44663

Dear Joe:

One soil sample for the Pier 91 Project #624878, Task #7304 was received at our laboratory February 3, 1993. This sample was received in good condition. The sample was analyzed for total metals and PCBs at the Burlington Environmental Corporate Laboratory.

All samples were extracted and analyzed within EPA SW-846 required holding times. Analysis dates and extraction dates (as applicable) are included in the metals report. The PCBs were extracted and analyzed in batches. These dates are tabulated below. All PCB surrogates recovered between 50% and 150%.

<u>Laboratory Number(s)</u>	<u>GC Run Number(s)</u>	<u>Date(s) Extracted</u>	<u>Date(s) Analyzed</u>
44663, QC1260, and B02053-2	AAKK and BAKK	2/5/93	2/8/93

The analyst(s) name(s) and the instrument used for each analyte are specified on the PCB report and are listed below for the metals analytes.

<u>Analyte(s)</u>	<u>Analyst</u>	<u>Instrument Make and Model</u>
Mercury	Barbara L. Walker	Perkin Elmer 50B Mercury Analyzer
Arsenic, Selenium, Lead	Bruce Bell	Perkin Elmer 5100Z Graphite Furnace Atomic Absorption Spectrometer
Silver, Barium, Cadmium, Copper, Chromium, Nickel, Zinc	Eric Larson	Leeman Labs PS3000 Inductively Coupled Plasma Atomic Emission Spectrometer

All analyses were conducted according to EPA SW-846 Methods specified in the work plan. Additional analytical and quality control information is included in the attached analytical reports.

Sincerely,

Kathy E. Kreps
Laboratory Manager
Burlington Environmental Inc.

enclosure



BURLINGTON
ENVIRONMENTAL

General Laboratory Report

Lab Number : 44663

Plant/Generator Name : Pier 91; Project #624878, Task #7304

Sample Type : Soil; CP-115B-18-20

Date of Receipt : 02/03/93 Analyst: BLW, EL, BB, GCH

Date of Report : 03/17/93 QC Checked: *Anthony Rupp* 3/17/93

Parameters for Analysis: Total Metals and PCBs

Outside Lab : None Outside Lab Report No:

Data:

This soil sample from the Pier 91 Project 624878, task 7304, labeled CP-115B-18-20, was analyzed for Total Metals and for PCBs. Copies of the results are attached.

Comments and Conclusions:

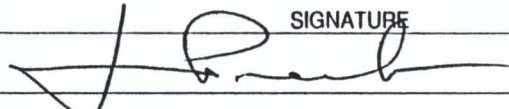
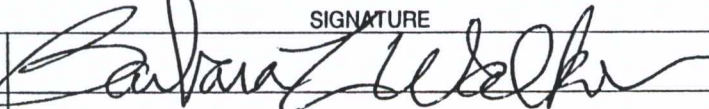


CHAIN-OF-CUSTODY RECORD

C.O.C. SERIAL NO. 6252

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SIGNATURE		DATE	TIME	SIGNATURE		DATE	TIME
		2-3-93	1455			2-3-93	3:00
SHIPPING NOTES				LAB NOTES			

PCB Laboratory Report

Page 1

Lab Number : 44663

Plant/Generator Name : PIER 91 / PJ #624878, TASK #7304

Sample Type : SOIL

Date of Receipt : 02/03/93

Date of Report : 02/10/93

Outside Lab :

Number of Samples : 1

Analyst: GCH

QC Checked: *OK* 2/10/93

Outside Lab Report No:

<u>Run #</u>	<u>Sample ID</u>	<u>Code Numbers</u>	<u># Drums in Composite</u>	<u>Aroclor #</u>	<u>Total PCB (ppm)</u>
AAKK10	44663	CP-115B-18-20			<0.043
AAKK12	B02053-2	BLANK			<0.1
BAKK65	QC 1260	1260 (ADVISORY RANGE 6.1-25)		1260	16.
AAKK9	CCV	1248		5.06	101%
AAKK13	CCV	1254		5.41	108%
BAKK64	CCV	1248		5.17	103%
BAKK66	CCV	1254		5.37	107%

INSTRUMENT = HP 5890 GC

ANALYST = GWENDOLYN C. HUGGINS

Metals Laboratory Report

Lab Number : 44663
Plant/Generator Name : PIER 91 PJ #624878, TASK #7304
Sample Type : SOIL
Date of Receipt : 02/03/93 Analyst: BLW, EL, BB
Date of Report : 02/17/99 QC Checked: *[Signature]*
Parameters for Analysis: TOTAL METALS
Outside Lab : NONE Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

	44663	44663 MS	44663 MSD	PDS
Metals:	CP-115B-18-20	% RECOVERY	% RECOVERY	% RECOVERY
Silver	<0.41	65.2	67.0	89.5
Arsenic	2.3	82.4	59.5	
Barium	14.6	91.0	88.2	
Beryllium	<0.20	91.8	92.2	
Cadmium	<0.20	82.8	83.6	
Chromium	21.2	112.9	126.5	87.9
Copper	7.0	93.4	95.8	
Mercury	0.026	106.9	111.6	
Nickel	23.4	103.7	109.0	
Lead	2.4	84.2	84.6	
Selenium	<0.48	21.2	31.2	
Zinc	18.6	103.0	106.2	
Dry Weight	76.5%			

Comments and Conclusions:

RESULTS REPORTED AS MG/KG DRY WEIGHT.
PDS = POST DIGESTION SPIKE

Metals Laboratory Report

Lab Number : 44663Q

Plant/Generator Name : PIER 91 Pj# 624878 TASK 7304

Sample Type : SOIL

Date of Receipt : 02/03/93

Analyst: BLW, EL, BB

Date of Report : 02/17/93

QC Checked:

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

Metals:	PREPARATION	% RECOVERY	ICV	CCV
	BLANK	PPS-46	% RECOVERY	% RECOVERY
Silver	<0.010	78.4		99.7
Arsenic	<0.010	111.6	108.4	95.0
Barium	<0.20	88.0		96.9
Beryllium	<0.005	81.3		97.9
Cadmium	<0.005	74.5		103.0
Chromium	<0.010	107.6		100.7
Copper	<0.025	88.0		98.0
Mercury	<0.0002	74.3*		92.6
Nickel	<0.040	84.3		103.2
Lead	<0.050	82.2		104.0
Selenium	<0.005	101.2	106.8	90.8
Zinc	<0.020	88.9		99.7

Comments and Conclusions:

RESULTS FOR BLANK IN MG/L.

* MERCURY CONTROL SAMPLE SRS003-50.

DATES ANALYZED: 2/9/93, 2/12/93.

Metals Laboratory Report

Lab Number : 44663Q

Plant/Generator Name : PIER 91 Pj# 624878 TASK 7304

Sample Type : SOIL

Date of Receipt : 02/03/93

Analyst: BLW, EL, BB

Date of Report : 02/17/93

QC Checked: *[Signature]* 2/17/93

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

<u>Metals:</u>	<u>CCV % RECOVERY</u>	<u>CCV % RECOVERY</u>
Silver	97.8	
Arsenic	95.4	98.4
Barium	95.3	
Beryllium	98.0	
Cadmium	103.6	
Chromium	99.2	
Copper	96.6	
Nickel	106.8	
Lead	101.8	
Selenium	91.8	
Zinc	99.2	

Comments and Conclusions:

RESULTS REPORTED AS PERCENT RECOVERY.



Certification

PriorityPollutnT™/CLP Quality Control Standards

Inorganics in Soil

Parameter	Lot Number 212 Certified Value mg/kg	Advisory Range mg/kg
TRACE METALS		
aluminum	11500	6530-16500
antimony	52	0-160
arsenic	15	5.6-25
barium	134	93-174
beryllium	15	9.5-21
cadmium	109	76-142
calcium	7130	4990-9270
chromium	41	20-62
cobalt	211	148-274
copper	20	8.0-32
iron	14500	10100-20150
lead	74	37-111
magnesium	3620	2530-4710
manganese	310	217-403
mercury	31	15-46
molybdenum	16	8.0-24
nickel	28	8.0-48
potassium	3790	2650-4930
selenium	91	45-136
silver	37	18-56
sodium	400	173-627
thallium	99	48-150
vanadium	57	40-74
zinc	53	26-80
CYANIDE	147	74-220

Certificate of Analysis

SOLID WASTE LABORATORY CONTROL SAMPLE

Catalog No: SRS003

Name: Metals on Soil

Lot No: BC003

USE EPA METHOD* 3050

Analysis by EPA* Method 3050

Arsenic (CAS# 1327-53-3)	30 + 20 PPM
Barium (CAS# 7440-39-3)	575 + 65 PPM
Cadmium (CAS# 7440-43-9)	1.3 + 0.7 PPM
Chromium (CAS# 7440-47-3)	12 + 5 PPM
Mercury (CAS# 7439-97-6)	6 + 3 PPM

*Test methods for evaluating SW846, Third Edition, 1986

Analytical ranges based on interlab 95% confidence levels.

Results based on a dry weight basis.

Manufactured by Resource Technology Corporation
for exclusive distribution by FISHER SCIENTIFIC.



Fisher
Scientific

Chemical Division
1 Reagent Lane
Fair Lawn, N.J. 07410
(201) 796-7100



210 West Sand Bank Road
P O Box 330
Columbia, IL 62236-0330
618/281-7173
618/281-5120 FAX

CHAIN-OF-CUSTODY RECORD

C.O.C. SERIAL NO.

[illegible]

6E-34 (1)



Burlington
Environmental

RECEIVED

MAR 18 1993

Burlington Environmental Inc.
Technical Services

March 17, 1993

Joe Depner
Burlington Environmental Technical Services
2203 Airport Way South, Suite 400
Seattle, WA 98134

Project: Pier 91 Project #624878, Task #7304
Burlington Environmental Corporate Laboratory Number 44469

Dear Joe:

One water and three soil samples for the Pier 91 Project #624878, Task #7304 were received at our laboratory January 26, 1993. The samples were received in good condition. The samples were analyzed for total metals and PCBs at the Burlington Environmental Corporate Laboratory.

All samples were extracted and analyzed within EPA SW-846 required holding times. Analysis dates and extraction dates (as applicable) are included in the metals report. The PCBs were extracted and analyzed in batches. These dates are tabulated below. All PCB surrogates recovered between 50% and 150%.

<u>Laboratory Number(s)</u>	<u>GC Run Number(s)</u>	<u>Date(s) Extracted</u>	<u>Date(s) Analyzed</u>
44469-1,2,3,4, QC1248, B01263-1 and B01263-2	AAKK and BAKK	1/26/93	1/28/93

The analyst(s) name(s) and the instrument used for each analyte are specified on the PCB report and are listed below for the metals analytes.

<u>Analyte(s)</u>	<u>Analyst</u>	<u>Instrument Make and Model</u>
Mercury	Barbara L. Walker	Perkin Elmer 50B Mercury Analyzer
Arsenic, Selenium, Lead	Bruce Bell	Perkin Elmer 5100Z Graphite Furnace Atomic Absorption Spectrometer
Silver, Barium, Cadmium, Copper, Chromium, Nickel, Zinc	Eric Larson	Leeman Labs PS3000 Inductively Coupled Plasma Atomic Emission Spectrometer

All analyses were conducted according to EPA SW-846 Methods specified in the work plan. Additional analytical and quality control information is included in the attached analytical reports.

Sincerely,

Kathy E. Kreps
Laboratory Manager
Burlington Environmental Inc.

enclosure



BURLINGTON
ENVIRONMENTAL

General Laboratory Report

Lab Number : 44469

Plant/Generator Name : Pier 91; Project #624878, Task #7304

Sample Type : Water & Soils; CP-122A and CP-106B

Date of Receipt : 01/26/93 Analyst: BLW, EL, BB, GCH

Date of Report : 03/17/93 QC Checked: *Notley Kays* 3/17/93

Parameters for Analysis: Total Metals and PCBs

Outside Lab : None Outside Lab Report No:

Data:

These water and soil samples from the Pier 91 Project 624878, Task 7304, labeled CP-122A-DW, CP-106B-2-4, CP-106B-6-8, and CP-106B-18-20, were analyzed for PCBs and for Total Metals. Copies of the results are attached.

Comments and Conclusions:



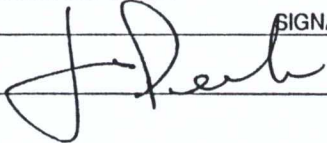

CHAIN-OF-CUSTODY RECORD

C.O.C. SERIAL NO. 6251

[illegible]

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RECEIVED BY

SIGNATURE		DATE	TIME	SIGNATURE		DATE	TIME
		1/26/93	8:15			1/26/93	8:15
SHIPPING NOTES				LAB NOTES			

Lab Number : 44469

Plant/Generator Name : PIER 91 / PJ #624878, TASK #7304

Sample Type : LIQUIDS & SOILS

Date of Receipt : 01/26/93

Analyst: GCH *AKW Jan 21/93*

Date of Report : 01/29/93

QC Checked: *AKW Jan 21/93*

Outside Lab :

Outside Lab Report No:

Number of Samples : 4

<u>Run #</u>	<u>Sample ID</u>	<u>Code Numbers</u>	<u># Drums in Composite</u>	<u>Aroclor #</u>	<u>Total PCB (ppm)</u>
BAKH71	44469-1	CP-122A-DW			<0.0001
BAKH72	44469-2	CP-106B-2-4		1260	0.386
BAKH73	44469-3	CP-106B-6-8		1260	0.098
BAKH74	44469-4	CP-106B-18-20			<0.042
BAKH76	B01263-1	BLANK			<0.0001
BAKH77	B01263-2	BLANK			<0.1
BAKH85	QC 1248	ADVISORY RANGE (11-38)		1248	29.
BAKH70	CCV	A1254		5.51	110%
BAKH79	CCV	A1248		4.89	98%
BAKH81	CCV	A1254		5.77	115%
BAKH90	CCV	A1254		5.74	115%

ANALYST = GWENDOLYN C. HUGGINS
INSTRUMENT = HP 5890 GC

Metals Laboratory Report

Lab Number : 44469

Plant/Generator Name : PIER 91 PJ #624878, TASK #7304

Sample Type : LIQUID & SOILS

Date of Receipt : 01/26/93

Analyst: BLW, EL, BB

Date of Report : 01/08/93

QC Checked

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

METALS BY SW-846 3010, 3050, 6010, 7000.

	44469-1	44469-2	44469-3	44469-4
Metals:	CP-122A-DW	CP-106B-2-4	CP-106B-6-8	CP-106B-18-20
Silver	<0.010	<0.42	<0.42	<0.42
Arsenic	<0.010	2.1	1.8	2.0
Barium	<0.20	271.	203.	19.3
Beryllium	<0.005	<0.21	<0.21	<0.21
Cadmium	<0.005	0.27	<0.21	<0.21
Chromium	<0.010	19.8	15.1	20.5
Copper	0.038	54.4	23.1	6.2
Mercury	<0.0002	0.12	0.12	<0.037
Nickel	<0.040	23.8	12.0	22.9
Lead	0.027	298.	111.	2.1
Selenium	<0.005	<0.44	<0.44	<0.22
Zinc	0.20	94.5	54.7	20.4
Dry Weight		91.8%	89.6%	78.8%

Comments and Conclusions:

RESULTS FOR SAMPLE -1 REPORTED IN MG/L, RESULTS
FOR SAMPLES -2, -3, -4 REPORTED IN MG/KG DRY WEIGHT.

Metals Laboratory Report

Lab Number : 44469Q

Plant/Generator Name : PIER 91 Pj# 624878 TASK 7304

Sample Type : WATER, SOILS

Date of Receipt : 01/26/93

Analyst: BLW, BB, EL

Date of Report : 02/08/93

QC Checked: *[Signature]* 2/8/93

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

METALS BY SW-846 3010, 6010, 7000.

Metals:	PREPARATION BLANK	CONTROL SAMPLE % RECOVERY	44469-1 MS % RECOVERY	44469-1 MSD % RECOVERY
Silver	<0.010	100.7	103.6	102.6
Arsenic	<0.010	92.5	93.0	94.0
Barium	<0.20	97.4	98.2	98.8
Beryllium	<0.005	97.8	99.6	99.6
Cadmium	<0.005	95.6	97.4	96.8
Chromium	<0.010	95.9	100.2	98.2
Copper	<0.025	95.6	120.0	119.4
Mercury	<0.0002	107.5	107.5	103.8
Nickel	<0.040	99.0	101.2	99.2
Lead	<0.003	107.0	98.0	98.0
Selenium	<0.005	110.0	93.6	100.9
Zinc	<0.020	94.3	110.4	95.6

Comments and Conclusions:

RESULTS ARE REPORTED AS MG/L.

DATES ANALYZED: 1/26/93, 1/29/93, 2/3/93.

Metals Laboratory Report

Lab Number : 44469Q

Plant/Generator Name : PIER 91 Pj# 624878 TASK 7304

Sample Type : WATER, SOILS

Date of Receipt : 01/26/93

Analyst: BLW, BB, EL

Date of Report : 02/08/93

QC Checked: *Heathen 2/8/93*

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

Metals:	PREPARATION BLANK (MG/L)	PPS-46 % RECOVERY	44469-3 MS % RECOVERY	44469-3 MSD % RECOVERY
Silver	<0.010	79.9	66.0	60.6
Arsenic	<0.010	96.0	75.9	67.5
Barium	<0.20	85.4	94.0	95.8
Beryllium	<0.005	83.9	93.4	94.8
Cadmium	<0.005	78.1	90.8	89.2
Chromium	<0.010	132.5	96.5	61.4
Copper	<0.025	92.4	91.7	83.6
Mercury	<0.0002	79.3*	84.3	78.3
Nickel	<0.040	89.1	82.9	83.6
Lead	<0.003	96.8	**	**
Selenium	<0.005	98.6	59.2	29.0
Zinc	<0.020	94.9	64.4	90.0

Comments and Conclusions:

RESULTS REPORTED AS PERCENT RECOVERY.

*MERCURY CHECK SAMPLE SRS003-50.

**SAMPLE RESULTS GREATER THAN 4X'S THE SPIKE
ADDED.

Metals Laboratory Report

Lab Number : 44469Q

Plant/Generator Name : PIER 91 Pj# 624878 TASK 7304

Sample Type : WATER, SOILS

Date of Receipt : 01/26/93

Analyst: BLW, BB EL

Date of Report : 02/08/93

QC Checked: *[Signature]*

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

Metals:	POST DIGESTION SPIKE RECOVERY	% RECOVERY ICV	CCV	CCV
Silver	90.1		101.3	99.7
Arsenic		99.7	97.5	
Barium			100.5	99.8
Beryllium			99.7	97.6
Cadmium			104.9	98.2
Chromium	88.5		102.6	98.4
Copper			97.8	95.5
Mercury			96.0	
Nickel			107.2	98.4
Lead		100.0	109.2	109.6
Selenium		95.6	103.3	98.4
Zinc	98.6		98.6	95.1

Comments and Conclusions:

RESULTS ARE REPORTED AS PERCENT RECOVERY.
THIS QC RUN WITH SAMPLE # 44469-1 (H2O).
DATES ANALYZED: 1/26/93, 1/29/93, 2/3/93.

Metals Laboratory Report

Lab Number : 44469Q

Plant/Generator Name : PIER 91 Pj# 624878 TASK 7304

Sample Type : WATER, SOILS

Date of Receipt : 01/26/93

Analyst: BLW, BB, EL

Date of Report : 02/08/93

QC Checked: *[Signature]*

Parameters for Analysis: TOTAL METALS

Outside Lab : NONE

Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

Metals:	% RECOVERY			
	CCV	CCV	CCV	CCV
Silver	99.7	99.0	97.5	
Arsenic	95.6	92.1	107.3	97.4
Barium	99.8	97.2	96.4	
Beryllium	97.6	98.6	97.9	
Cadmium	98.2	101.1	100.1	
Chromium	98.4	99.7	97.3	
Copper	95.5	98.6	96.5	
Mercury		96.6		
Nickel	98.4	101.9	99.6	
Lead	101.1	101.3	106.4	109.2
Selenium	96.0	99.0	90.1	90.5
Zinc	95.1	100.0	99.1	

Comments and Conclusions:

RESULTS ARE REPORTED IN PERCENT RECOVERY.

THIS QC RUN WITH SOIL SAMPLES -2, -3, -4.

DATES ANALYZED: 1/26/93, 1/29/93, 2/1/93, 2/2/93.

Metals Laboratory Report

Lab Number : 44469Q
Plant/Generator Name : PIER 91 Pj# 624878 TASK 7304
Sample Type : WATER, SOILS
Date of Receipt : 01/26/93 Analyst: BLW, BB, EL
Date of Report : 02/08/93 QC Checked: *[Signature]* 2/8/93
Parameters for Analysis: TOTAL METALS
Outside Lab : NONE Outside Lab Report No:

METALS BY SW-846 3050, 6010, 7000.

	% RECOVERY		
Metals:	CCV	ICV	ICV
Arsenic	103.2	102.0	100.0
Lead	104.0	98.0	100.0
Selenium		94.4	

Comments and Conclusions:

RESULTS ARE REPORTED AS PERCENT RECOVERY.
QC RUN WITH SOIL SAMPLES.



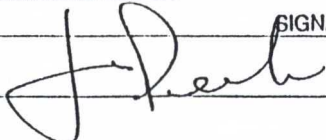

CHAIN-OF-CUSTODY RECORD

C.O.C. SERIAL NO. 6251

[illegible]

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RECEIVED BY

SIGNATURE		DATE	TIME	SIGNATURE		DATE	TIME
		1/26/93	8:15			1/26/93	8:15
SHIPPING NOTES				LAB NOTES			

Certificate of Analysis

SOLID WASTE LABORATORY CONTROL SAMPLE

Catalog No: SRS003

Name: Metals on Soil

Lot No: BC003

USE EPA METHOD* 3050

Analysis by EPA* Method 3050

Arsenic (CAS# 1327-53-3)	30 + 20 PPM
Barium (CAS# 7440-39-3)	575 + 65 PPM
Cadmium (CAS# 7440-43-9)	1.3 + 0.7 PPM
Chromium (CAS# 7440-47-3)	12 + 5 PPM
Mercury (CAS# 7439-97-6)	6 + 3 PPM

* Test methods for evaluating SW846, Third Edition, 1986

Analytical ranges based on interlab 95% confidence levels.

Results based on a dry weight basis.

Manufactured by Resource Technology Corporation
for exclusive distribution by FISHER SCIENTIFIC.



Fisher
Scientific

Chemical Division
1 Reagent Lane
Fair Lawn, N.J. 07410
(201) 796-7100



Certification

PriorityPollutnT™/CLP Quality Control Standards

Inorganics in Soil

Parameter	Lot Number 212 Certified Value mg/kg	Advisory Range mg/kg
TRACE METALS		
aluminum	11500	6530-16500
antimony	52	0-160
arsenic	15	5.6-25
barium	134	93-174
beryllium	15	9.5-21
cadmium	109	76-142
calcium	7130	4990-9270
chromium	41	20-62
cobalt	211	148-274
copper	20	8.0-32
iron	14500	10100-20150
lead	74	37-111
magnesium	3620	2530-4710
manganese	310	217-403
mercury	31	15-46
molybdenum	16	8.0-24
nickel	28	8.0-48
potassium	3790	2650-4930
selenium	91	45-136
silver	37	18-56
sodium	400	173-627
thallium	99	48-150
vanadium	57	40-74
zinc	53	26-80
CYANIDE	147	74-220